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Indian Standard

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उपभोक्ता सामानों के लिए बंधक — संश्लिष्ट हुक और फंदा टेप — विशिष्टि

(तीसरा पुनरीक्षण)

Fastners for Consumer Goods — Synthetic Hook and Loop Tape — Specification

(Third Revision)

ICS 81.040

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Price Group 4

Consumer Products and Allied Equipments Sectional Committee, PGD 14

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Consumer Products and Allied Equipments Sectional Committee had been approved by the Production and General Engineering Division Council.

With the advancement of technology, the synthetic hook and loop tapes are being used in more and diversified fields. These revolutionary fasteners are gentle enough to be used in baby's diapers replacing safety pins and yet sturdy and reliable enough to be used even in aircrafts and space-ships and now as household fasteners.

This standard was originally issued in 1976 and subsequently revised in 1981 and 1994. This revision is based on the prevalent practice followed by the Indian industry. In the present revision the following modifications have been made:

a) Recommendation of Nylon 6 as material of manufacture for portions of loop tape in place of Nylon 6.6.
b) Clause **4.2** of earlier version is deleted.
c) Values for strength of tapes are revised.
d) Endurance test is modified.
e) Values for shrinkage of hook and loop tape are revised.
f) A new clause on dot tear of hook and loop tape is included and also a new Annex for method of dot tear test is included.
g) A new clause on dyeing is included.
h) Packing clause is modified.
j) Requirement for ultrasonic sealing is included.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FASTENERS FOR CONSUMER GOODS — SYNTHETIC HOOK AND LOOP TAPE — SPECIFICATION

(Third Revision)

1 SCOPE

This standard covers the dimensions, materials and other requirements pertaining to construction and performance for synthetic tape fasteners consisting of a hook tape and a loop tape.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS No.	*Title*
690 : 1988	Method for determination of colour fastness of textile materials to sea water (*first revision*)
1481 : 1970	Specification for metric steel scales for engineers
2454 : 1985	Methods for determination of colour fastness of textile materials to artificial light (xenon lamp) (*first revision*)
2500 (Part 1) : 2000	Sampling inspection procedures : Part 1 Attributes sampling plans indexed by acceptable quality level (AQL) for lot by lot inspection (*second revision*)
IS/ISO 105- C10 : 2006	Textiles — Tests for colour fastness Part C10 Colour fastness to washing with soap or soda and soda

3 CONSTRUCTION

3.1 The tape fastener shall be of the following types:

a) Hook Tape, and
b) Loop Tape.

4 MATERIAL

4.1 Hook and loop tape fasteners shall be manufactured from nylon yarns. The hook (pile) shall be manufactured from nylon 6.6 monofilament yarn and the loop (pile) portion can be manufactured from nylon 6 multifilament yarn. The binder ground threads of the hook and loop tapes may be made of nylon 6. Nylon 6.6 shall be tested according to the procedure given in Annex A.

5 DIMENSIONS

5.1 The recommended sizes are as follows:

Nominal Width mm	*Length* m
16, 20, 25	25, 100
30, 38, 50	—

5.1.1 The average width of AQL samples shall not be lower than the agreed width by more than 1.5 mm, when measured as described in Annex B.

5.1.2 The average length of AQL samples shall not be lower than the agreed length by more than one percent, when measured as described in Annex C.

5.1.3 If required for a particular application, the sizes other than those given in **5.1** may be used.

6 MANUFACTURE, WORKMANSHIP AND FINISH

6.1 The hook component of the hook tape shall be woven using nylon 6.6 monofilament yarn (pile) and narrow fabric construction with nylon 6 multifilament yarn. A selvedge of 1 mm to 3 mm shall be provided alongwith both the edges to facilitate stitching. Monofilament auxiliary warp ends shall be woven in the form of raised loops, which are the uncut hooks of the hook tape. These uncut hooks shall be heat set to retain their shape. They shall be cut near the top in order to form free hook engaging section (locking element). The hook shall be leno-woven in staggered order.

6.2 The loop component of the loop tape shall be manufactured using the nylon 6 multifilament yarn (pile) and the narrow fabric construction with nylon 6 multifilament yarn. A selvedge of 1 mm to 3 mm shall be provided alongwith both the edges to facilitate stitching.

NOTE (*for information only*) — Nylon 6 multifilament yarn (pile) for loop component of the loop tape to have a minimum tenacity of 6.8 gf/D.

6.3 The hook and loop tapes shall be stabilized as necessary and pre-shrunk to ensure maximum flatness, evenness and dimensional stability. The back of the tape shall be coated with an elastomeric coating. The coating shall be properly cured.

6.4 The hook and loop tape fasteners may be supplied in any colour as desired by the purchaser. The shade shall be uniform throughout on both the hook and loop tapes.

7 PERFORMANCE

7.1 Colour Fastness

The dyed type hook and loop tape components shall show colour fastness to light, crocking, washing and sea water when tested as described in Annex D.

7.2 Strength of Tapes

The minimum strength for all types of tapes shall be as mentioned in Table 1 when tested according to Annex E.

Table 1 Minimum Strength of Hook and Loop Tape

Type of Tape	Shear Strength (Lengthwise)	Shear Strength (Widthwise)	Peel Strength
	g/cm^2	g/cm^2	g/cm
(1)	(2)	(3)	(4)
On any width of hook and loop tape closure	900	900	200

7.3 Shrinkage

The shrinkage of the hook tape and loop tape in the longitudinal direction shall not exceed 2 percent. The method of test shall be as given in Annex F.

7.4 Endurance Test

The shear strength of all types of tapes shall not be less than 675 g/cm^2 after being subjected to 5 000 cycles of closing and opening operations, which may be carried our either manually or by a suitable systematic motor driven method. A typical motor driven schematic arrangement is given in Annex G for guidance.

7.5 Dot Tear Test

The dot tear of the hook and loop tapes must not be less than 25 N. The dot tear of the hook and loop tapes may be carried out by a tensile strength testing machine as per the procedure given in Annex H.

8 DYEING AND COATING

8.1 The hook and loop tapes shall be dyed suitably. The dyes that are used for the dyeing of the hook and loop tapes shall be azofree dyes and free from formaldehyde.

8.2 The tapes shall conform to the requirements of this standard prior to the application of the adhesive backings.

8.3 The precoats may be activated with water, solvents like methyl ethyl ketone, toluene, acetone, as agreed to between the purchaser and the supplier.

8.4 The back of the tapes may be coated with a flame retardant coating instead of elastomeric coating as per **6.3** if required by the purchaser.

9 SAMPLING

9.1 Unless otherwise agreed to between the supplier and the purchaser, the procedure given in IS 2500 (Part 1) shall be followed for sampling and inspection. The inspection level and sampling plan as given in **9.1.1** and **9.1.2** shall be followed.

9.1.1 The scale of sampling shall be corresponding to 'Inspection Level III' given in Table 1 of IS 2500 (Part 1).

9.1.2 The sampling plan to be followed shall be single sampling plan corresponding to Acceptable Quality Level (AQL) value of 2.5 percent given in Table 2A of IS 2500 (Part 1).

10 MARKING

10.1 Each package of roll(s) of the tapes shall be legibly and indelibly marked with the following:

a) Name or trade-mark indicating source of manufacture,
b) Width and length of the tapes,
c) Batch number, and
d) Month and year of manufacture.

10.2 BIS Certification Marking

10.2.1 The product may also be marked with the Standard Mark.

10.2.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act,* 1986, and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

11 PACKING

11.1 The packing of hook and loop tape fasteners shall be as per agreement between the purchaser and the manufacturer.

11.2 The hook and loop tape fasteners shall be packed in rolls of 25m or 100m as agreed to between the purchaser and the manufacturer.

11.3 The end of the hook or loop tape should be ultrasonically sealed.

ANNEX A

(*Clause* 4.1)

METHOD FOR DETERMINATION OF NYLON 6.6 YARNS

A-1 The material used for manufacture is dipped in the following reagents:

a) Hydrochloric acid having specific gravity 1.075,

b) 42 percent formic acid at 100°C, and

c) Mixture of 25 ml formic acid and 75 ml dimethyl formamide (DMF) at boil.

A-2 If the material used for manufacture is nylon 6.6 it shall not dissolve in any of the above reagents.

ANNEX B

(*Clause* 5.1.1)

DETERMINATION OF WIDTH

B-1 Steel scale with graduation up to 0.25 mm shall be used to measure the width. The steel scale shall be placed on the table and the sample tape shall be laid flat perpendicular to the scale. Width reading would be taken up to 0.25 mm. A number of readings shall be taken from different samples (one from each sample) and the arithmetical average shall be taken to arrive at the average width of the sample.

ANNEX C

(*Clause* 5.1.2)

DETERMINATION OF LENGTH

C-1 The tape from the sample roll shall be laid flat on the table marked 5 m length on it. The measurement in excess or short of 5 m shall be made with a scale of 1 m length or less (*see* IS 1481). Number of such samples (rolls) would be selected as per **9**. The arithmetical average of all length shall be determined to check the length as per **5.1.2**.

ANNEX D

(*Clause* 7.1)

TEST FOR COLOUR FASTNESS

D-1 FASTNESS TO LIGHT

D-1.1 The colour of the tapes thread shall be fast to light and when tested by the method prescribed in IS 2454, its colour fastness to light shall be of rating 3 or better.

D-2 FASTNESS TO SEA WATER

D-2.1 The tapes shall be fast to sea water and when tested by the method prescribed in IS 690, its colour fastness to sea water shall be rating 3 or better.

D-3 FASTNESS TO WASHING

D-3.1 The tapes shall be fast to washing and when tested by the method prescribed in IS/ISO 105-C10, its colour fastness for washing shall be rating 3 or better. However, the testing temperature shall be 70 ± 2°C instead of 95 ± 2°C as prescribed in **7.2** of IS/ISO 105-C10.

D-4 CROCKING TEST

D-4.1 Dry and Wet Crocking

A crockmeter shall be used in this test along with a 50 mm × 50 mm square of bleached, unsized cotton fabric piece. Cut a piece of hook or loop tape 180 mm long. Place the tape face up on the abrasive area of the crockmeter fasten ends with suitable adhesive tape and/ or rubber band. Fasten 5 cm × 5 cm square cotton fabric piece on the finger tip with a rubber band. Turn the crank so that the cloth on the finger is rubbed over the tape a total of 10 times in each direction. Turn the tape over and attach new 50 mm × 50 mm square cotton fabric piece. Again, turn the crank so that the cloth is rubbed over the tape a total 10 times in each direction.

Soak two square cloth pieces in distilled water, lay them between blotters and squeeze by finger. Repeat the test as above on face and back using moistened cloth pieces.

Evaluate the amount of staining on the 5 cm × 5 cm square numerically.

The rating shall be 3 or better.

5 — No staining

4 — Slight staining

3 — Definite staining

2 — Bad staining

1 — Very bad staining

ANNEX E

(Clause 7.2)

TEST FOR SHEAR, PEEL AND TENSILE STRENGTH

E-1 The apparatus shall be as follows:

E-1.1 A pendulum type tester with cam drive shall be used for the tests to minimize the possibility of slipping as well as for the ease of putting the samples in the jaws.

E-1.2 A constant power driven tensile testing machine having a constant rate of loading type the rate of which being such that the time taken to reach the load may be suitably adjusted.

E-1.2.1 The rate of traverse shall be constant. The jaw separation speed should be 305 mm / min.

E-1.3 A steel roller having a diameter of 121 mm and 57 mm wide weighing 5 kg for mating the tape components.

E-2 REQUIREMENTS OF TEST SPECIMEN

E-2.1 The test specimen shall be as follows:

Type of Test	*Size of Hook and Loop Tape* mm
Peel strength	175
Shear strength (length-wise)	125
Shear strength (width-wise)	50

E-3 PREPARATION OF THE TEST SPECIMEN FOR PEEL AND SHEAR STRENGTH TEST

E-3.1 Mating the Components

Select the same width of hook and loop tape of the length specified in **E-2.1**. Place the hook tape (hook side down) evenly and without pressure on tape of a corresponding equal width of loop tape (loop side up). Mesh the two tapes by traversing the steel roller back and forth across the overlap for 5 times in each direction. The pressure shall be applied evenly across the full width of the combined tapes in a smooth and continuous way. The hand pressure shall not be applied. The roller alone shall exert the required pressure.

E-4 PROCEDURE FOR PEEL AND SHEAR STRENGTH TEST

E-4.1 Grip one end of the free hook or loop tape in the upper jaw and the other end in the lower jaw of the machine. Apply a continuous increase in load to the specimen longitudinally until the specimen is loosened and separated. Note down the reading.

E-4.2 The peel strength (longitudinal) and shear strength (longitudinal) shall be conducted in the same way as mentioned in **E-4.1**.

E-4.3 The peel strength (width-wise) may be conducted if specifically insisted by the purchaser.

ANNEX F

(*Clause* 7.3)

METHOD FOR DETERMINATION OF SHRINKAGE

F-1 OUTLINE OF THE METHOD

F-1.1 Shrinkage is determined by finding the difference in longitudinal measurement before and after washing the specimen. The shrinkage shall be expressed in percentage.

F-1.2 Apparatus

F-1.2.1 A suitable washing machine with a cylinder 535 mm in diameter rotating at 60 rev/min shall be used. The water temperature of washing machine shall be maintained at 70°C ± 2°C by means of an electric pad. The machine shall be able to run continuously in the wash cycle for this test.

F-2 TEST SPECIMEN

F-2.1 Cut about 560 mm long hook and loop tapes of the same size and thickness. Make two marks 500 mm apart on the back of the tapes using the laundry mark.

F-2.2 PROCEDURE

F-2.2.1 Put the sample into the washing machine with enough household detergent to form a thin layer of suds and wash for 4 h. Rinse and dry the specimen.

F-2.2.2 Recondition the specimen at 27°C ± 1°C temperature, and 65 ± 2 percent relative humidity until it reaches a constant mass (a constant mass is considered to be achieved when measurements made at 1h intervals do not show a change in mass greater than 0.25 percent).

F-2.2.3 Measure the distance between the marks on the back of the tapes in the length-wise direction. This shall be the laundered length.

F-2.2.4 Calculate the percentage shrinkage as follows:

$$\text{Percentage shrinkage} = \frac{\left(\begin{matrix}\text{Original}\\ \text{length}\end{matrix}\right) - \left(\begin{matrix}\text{Laundered}\\ \text{length}\end{matrix}\right)}{\text{Original length}} \times 100$$

ANNEX G

(*Clause* 7.4)

METHOD FOR ENDURANCE TEST

G-1 This machine consists of two drums mounted one on top of the other (schematic arrangement is shown in Fig. 1) the bottom drum is driven at 60 rev/min with the direction of rotation reversed every 30s. The machine is fitted with a counter which counts the number of cycles regardless of direction of rotation. The drive from the bottom drum is imparted to the top drum through the physical contact of the hook and loop tape fastener under test.

G-2 The bottom drum is 160 mm in diameter and 70 mm wide with a slot 55 rum long cut into the rim for mounting the sample. The loop tape sample is mounted onto this drum free from any wrinkles and creases with the stitching of the loop being used to clamp the specimen in place.

G-3 The top drum is 162.5 mm in diameter and 70 mm wide with a slot 55 mm long cut into the rim and can rotate freely. The hook tape is mounted onto this drum free from any wrinkles or creases and clamped in place through the slot using the stitching of the loop. The drive from the bottom drum is imparted to the top drum contact between the hook tape and the loop tape. This drum has a means of loading the drum with 1 kg/cm width of fastener.

G-4 If necessary, it is allowable to mount two narrow tapes, side by side on the drums provided the top drum is still loaded with 1 kg of total width of tapes in cm.

G-5 If due to stretching of the tape during cycling it becomes difficult to adjust the fastener to the correct tension and position, it is permissible to stick the tapes to the drum using double sided adhesive tape.

G-6 When removing the samples from the machine it is important to mark where the fastener passes through the slot to ensure that only those areas worn by cycling are subsequently tested for shear strength and peel strength.

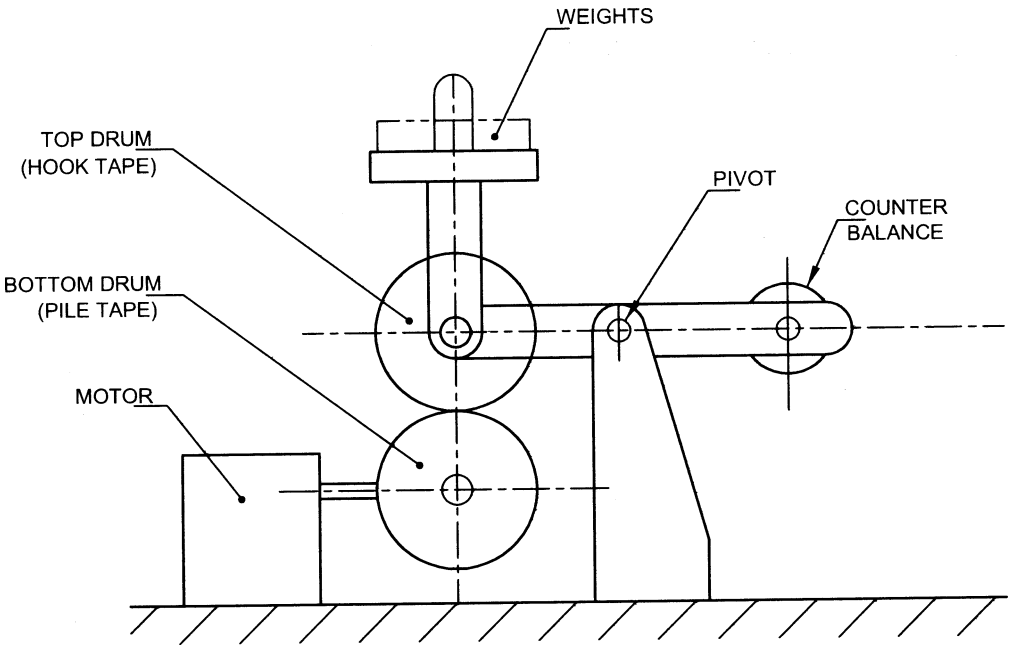

FIG.1 SCHEMATIC DIAGRAM FOR ENDURANCE TEST

ANNEX H

(*Clause* 7.5)

METHOD FOR DOT TEAR TEST

H-1 POCERDURE

H-1.1 Take a sample, hook or loop (120 to150 mm in length).

H-1.2 Mark a horizontal line at a distance of 50 mm from one end of the sample.

H-1.3 Cut the sample in between upto 50 mm mark.

H-1.4 Fix one end of the sample in the upper jaw and other end in the lower jaw of the tensile strength testing machine.

H-1.5 Put on the weights.

H-1.6 Now remove the key of upper jaw and adjust the pointer to the zero mark.

H-1.7 Switch on the machine and take the average reading on the outer scale of the machine till the tape is completely teared off.

H-1.8 The reading (in Newton) is the dot tear of the sample.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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